Similarly, at line 10 of page 4: " the profile of the contact surface between the control shaft ....are properly selected to provide valve lifts from substantially zero to a maximum, with acceptably small valve clearance,"
The specific mechanism cannot provide substantially zero valve lifts unless an additional mechanism for displacing the rocker arm axis (9) is incorporated. But in case of displacement of the rocker arm axis, the "acceptably small clearance" feature of the mechanism is canceled/lost and the mechanism behaves as a "scissor mechanism".

The differences between the 10/538,907 patent application and the US 6,145,485 become obvious, to the skilled in the art, by the following:

The rotation, for some angle, of the control shaft (39) displaces the roller (7) via the intermediate members (36) closer or away from the rocker arm axis (9). This displacement introduces a significant change of the timing of the valve events (opening and closing of the valve), which makes the need of a cooperating phaser (VVT) absolutely necessary. As shown in Fig 3 of US 6,145,485, for lower valve lifts (set of curves 2'), the valve opening and valve closing are significantly advanced. On the contrary, Fig 17 of 10/538,907 shows a set of valve lift profiles for the case of the constant duration version: the opening and closing of the valves happen always at the same camshaft angle.

As the control shaft (39) of the US 6,145,485 rotates displacing the roller (7) away from the rocker arm axis (9), the valve lift decreases continuously to a limit and the valve clearance can be as small as necessary. But the limit of the minimum "valve lift" is about equal to the "cam lift", because the rocker "ratio" (when the roller (7) is far away form the rocker arm axis (9) but still in cooperation with the cam lobe (14) and the rocker arm (6)) is about 1 according Fig 2 of US 6,145,485. The only way to further decrease the valve lift is to incorporate an additional mechanism that displaces the axis (9) of the rocker arm. But in this case the clearance becomes anything but short / tolerable / acceptable. And the rocker is no longer a rocker, as it is known in art, because of the moving fulcrum.

On the contrary, the mechanisms of 10/538,907 (for instance the general case shown in Fig 1, or the mechanism shown in Fig 18 etc) provide continuously variable valve lifts from a maximum to zero, keeping the clearance as small as desirable and as it is, currently, the case in the art.

The animation at
http://www.pattakon.com/vvar/VVAFreeRollersRockersCommonCam.exe shows a VVA using rocker arms and free rollers, with the camshaft located below the pivot shaft of the rockers. It can change continuously the valve lift from substantially zero to a maximum. Depending on the profile of the rotatable control surface, it can operate either as a lost motion VVA or as a Constant Duration. The free roller abuts simultaneously the rotatable control shaft, the cam lobe and the rocker (or valve actuator). No need for additional mechanisms to go to low and very low valve lifts. Not to mention that there is no need for additional timing mechanism (VVT) to advance or retard the valve events.

The photos at http://www.pattakon.com/vvar/OnBoard/Assembly.exe and http://www.pattakon.com/vvar/OnBoard/LVVA.htm make clear the meaning of the free roller in a real application (video with the prototype revving at 9.000 rpm on the road at http://www.pattakon.com/vvar/OnBoard/A1.MOV). The free roller is trapped between the control shaft, the camshaft and the valve actuator (which is a rocker arm having / holding a roller on it).
Each free roller is simply in simultaneous abutment to all three of them.
After installing the rocker arm and the control shaft on the cylinder head, the free rollers are "just" left at their position and then the camshaft is installed.
Each free roller is "just" trapped between these three parts (rocker arm, control shaft and cam lobe), and these three parts cooperate by means of the free roller (only rolling, not sliding).
There is no need for other means to hold the free rollers.
The external ring of the free roller abuts both, the cam lobe of the camshaft and the rocker arm roller, while its pin is in abutment to a cylindrical surface cut on the control shaft. The free roller is connected / pinned at nowhere, with nothing.
The "free roller" architecture reduces the friction and the friction places (the number of the joints), provides true robust construction, minimizes the inertia of the quick moving parts, etc.

By eliminating the connecting rods (36), by eliminating all the additional parts used for low and very low lifts, by modifying the rocker 6 to comprise a roller at the opposite, to the valve, side and by modifying the control shaft properly, the mechanism shown at http://www.pattakon.com/vvar/VVAFreeRollersRockersCommonControl.exe results which, depending on the angular displacement of the control shaft, provides a continuously variable valve lift from a maximum to zero. And the rocker arm is rid of heavy "control surfaces" like the 6.

As a conclusion:
Neither the operational characteristics (i.e. the provided valve lift profiles) of the Bidlingmaier (BMW) patent are similar / comparable to those of the 10/538,907, nor the constituent parts and their cooperation could lead the skilled in the art from the Bidlingmaier's to 10/538,907.
It became also clear the simplicity, the straightforwardness and the significance of the coupling of the three components (rotatable control shaft, cam lobe, valve actuator) by the free roller which is trapped among them and in simultaneous abutment to all three of them.

8. **Claims 1-8, and 10 are rejected under 35 U.S.C. 102(e) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as being obvious over Turner (GB'271)**

At line 11 of page 5 of your letter it is written: " the roller is a free roller trapped among the control cam, the control shaft and the valve actuator"
But neither the roller (18) is a free roller because it is secured/pinned on the first rocker (15), nor the other roller (27) is a free roller because it is connected to the control shaft (29) via the intermediate arm (28) which is rotatably mounted on the control shaft (29).

None of these two rollers is trapped among the control cam, the control shaft and the valve actuator.
By eliminating the rocker (15), by eliminating also the roller (18), by eliminating also the lever (28), by displacing lower the cam shaft (14) in order the roller (27) to abut the cam lobe (13), and by changing the control shaft to a flat surface rotatable about the center of the roller (27) when the latter abuts the basic circle of the cam lobe (13), the mechanism becomes the one described in the 10/538,907.

Or equivalently, by eliminating the rocker (15) and the rocker shaft (17) and the roller (18) and the lever (28), and by leaving the control shaft (29) only/simply to abut the roller (27) the mechanism of 10/538,907 results.

Animation of such a mechanism is at
http://www.pattakon.com/vvar/VVAFreeRollerRockerFlatControl.exe . Besides providing infinite continuously variable valve lifts from zero to a maximum, this mechanism is way simpler (just to mention that even the top surface of the rocker arm (16) does not need a circular part like (31) any more), way more robust, way lighter and significantly shorter and cheaper than the mechanism described in the GB 2,384,271 (Turner, LOTUS) patent.
In the light of the previous, the 10/538,907 is not obvious to the skilled in the art (unless LOTUS is not skilled in the art, or unless to remove many parts from an existing mechanism, improving at the same time its functionality, is not an inventive step).

9. **Claims 1-7 and 9-14 are rejected under 35 U.S.C. 102(e) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as being obvious over Naumann (DE '612)**

At line 6 of page 6 of your letter it is written: "a roller (3; 21; 39); a control shaft (to hold 3; to hold 21; to hold 39) rotatable about an axis (of 4; of 25; of 43) of said caring;"

The mechanisms of Figs 1 to 3 of DE 101 36 612 A1 are all Lost Motion VVAs.

At Fig 1 of DE 101 36 612 A1 the control shaft is the 12 and is not rotatable about the axis (of 4) but it is rotatable about the axis (of 9) when the valve 1 is closed.
What is rotatable about the "movable" axis (of 4) of the control shaft 12, is a rocker 2 that holds the roller 3. This rocker 2 is rotatable about the axis (of 4).
Depending on the position of the axis (of 4), the surface 6, 7 of the rocker 2 displaces the other rocker 8 and the valve 1 at a variable duration and variable lift profile.
By eliminating the rocker 2 (to free the roller 3), by displacing lower the "free roller" and the cam lobe 17, in order the roller 3 to abut on the roller 9 of the rocker 8, and by replacing the control shaft 12 by a rotatable – about the axis (of 9) when the valve is closed – control shaft surface (a control surface that moves slowly and only when the valve lift profile has to be changed), what is left is the mechanism shown in the animation http://www.pattakon.com/vvar/LostMotion/LostMotion1.exe .
The control shaft – which rotates "slowly" and only when a different valve lift profile is desirable – can be as robust as desirable without limiting the reliable rev limit of the valve train. In comparison the rocker 2, that holds the roller 3 of DE 101 36 612 A1,

has to carry the necessarily heavy "control surface" 6 and 7, while the restore spring 18 has to be hard enough to restore the heavy assembly at high revs.

At Fig 2 the control shaft (to hold 21) is not rotatable about the axis (of 25) but about the axis (of 32). The 24 is a first rocker having a control surface 26 - 27 that displaces the roller 21. Depending on the angular position of the 31 about the axis (of 32), the rocker 24 displaces the roller 21 and the roller 21 displaces the rocker 20 which in turn displaces the valve 19 in a variable duration and variable lift profile.
By eliminating the rocker arm 24, by eliminating the rocker arm 26, by displacing the roller 21 together with the lever 23 in order the roller 21 to abut on the cam lobe 28 and the lever 30 to be swivelably coupled to a "cylindrical pin valve actuator" on top of the valve 19, and by replacing the control shaft 31 by a control shaft rotatable about the axis of the swivel join between the lever 30 and the valve actuator (the control surface moves slowly and only when the valve lift profile has to be changed), what is left is the mechanism shown in the animation http://www.pattakon.com/LostMotion/LostMotion4.exe . This mechanism is a fully functional Lost Motion VVA, comprising quite fewer parts and joints between the cam lobe and the valve.

At Fig 3 the rocker 38 (which is a rocker and not a control shaft) holds the roller 39. The control shaft 41, rotatable about an axis, holds the rocker arm 38 which holds the roller 39. This solution has a geometrical problem: as the control shaft 41 is rotated about its rotation axis the clearance of the valve changes (the surface 45 of radius R cannot keep the clearance as the axis (of 42) changes its distance from the axis (of 45).
By eliminating the rocker 38 (to free the roller 39) and by displacing lower the cam lobe and the roller 39, and by replacing the control shaft 41 by one rotatable about the axis (of 47) and having a proper control surface on it (moving slowly and only when the valve profile has to be changed), what is left is the LostMotion1.exe mechanism shown at the http://www.pattakon.com/vvar/LostMotion/index.html.

In all three cases of the DE 101 36 612 A1 (now US 7,111,600) there is no free roller and the roller cannot be in simultaneous abutment to: the cam lobe, the control shaft and the valve actuator.

10. **"Claim 15 is rejected ...",** page 7 from the line 12 to the end of the page.

As long as the examiner writes that the PCTGR02/00035 (now US 6,892,684 patent) covers the claim 15 of 10/538,907, the applicant of both has no reason to object.

Remarks:

Attached are copies (six pages, from 1/6 to 6/6) of some of the papers sent to the USPTO on June 07, 2005, for the entry into the National Phase of PCT/GR04/00043 application, and the letter sent to the USPTO Commissioner for Patents on May 11, 2006 (just after the publication of the patent application in USPTO).

In the "fee calculation form" the applicant calculates 11 claims in total, with 4 independent claims, which means a surcharge of US 100$ for a small entity, i.e. US 550$ in total.
The original claims as filed in PCT were 15, with only 2 of them being independent.
The amended claims (attached, published in WIPO on 21 April 2005, i.e. before the entry into the National phase in USA) are 11, with 4 of them being independent.
But in the US 2006/0091344 A1 patent publication (May 4, 2006), more than a year after the WIPO publication of the amended claims, instead of the amended claims they were published the original ones.

So, please base your search report and the rest actions on the 11 amended claims. The fee calculation form clearly corresponds to these 11 amended claims and not to the 15 original ones.
The letter mailed on May 11, 2006 refers this mistake and asks for the correction.
This letter refers also to another mistake. The applicants and inventors are exactly the same persons with those mentioned in the PCT/GR04/00043 International Application.

Remarks:

On August 28, 2007 it was granted to Hyundai the US 7,261,074 patent. Filed on USPTO: December 8, 2005. Earliest priority Nov 15, 2005.

On February 2005 it was published in WIPO the PCT/GR04/00043.
And since the end of 2003 at the http://www.pattakon/com web site there were presented many animations, explanations, photos and data from the prototypes VVAs. This web site was, since 2003, at the first rows of the web "search engines" when searching for "Variable Valve Actuation" systems.

Doesn't the PCT/GR04/00043 anticipates the above Hundai patent?
Isn't the above Hyundai's patent non obvious to the skilled in the art under the light of the elementary Fig 1 of PCT/GR04/00043?
Isn't the above Hyundai's patent non obvious to the skilled in the art after a few seconds look at the
http://www.pattakon.com/vvar/VVAFreeRollerRockerFlatControl.exe animation (published before 2004)?

Remarks:

This reply letter was sent also by e-mail to ching.chang@uspto.gov to make easier the access to the web files and animations mentioned and for the sake of time saving.
Please use email (manousos.pattakos@pattakon.com or vva@pattakon.com) or fax (+30210-4934402 Greece) for your questions, for the sake of time saving.

Thank you
Manousos Pattakos

June 7, 2005

To
Commissioner for Patents
PO box 1450
Alexandria, VA 22313-1450
USA

From PATTAKOS Manousos
Lampraki 356
Nikea Piraeus
Post Code 18452 GR
GREECE

Subject: Entry into the National Phase in USA (as a designated office) of the PCT/GR04/000043 Application.

Dear Sir/Madam
Please find here attached the completed document for the entry into the National Phase in USA of the PCT/GR04/000043 International Application with title "Variable Valve Gear".

A completed Credit Card Payment Form (VISA card) is included.

Please notify me if something is missing.

Also please confirm the reception of the documents (my e-mail address is manousos.pattakos@pattakon.com and vva@pattakon.com).

Best Regards
Manousos PATTAKOS

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER

U.S. APPLICATION NO (If known, see 37 CFR 1.5)

INTERNATIONAL APPLICATION NO	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/GR2004/000043	AUGUST 12, 2004	AUGUST 18, 2003

TITLE OF INVENTION: VARIABLE VALVE GEAR

APPLICANT(S) FOR DO/EO/US: PATTAKOS, Manousos

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a submission under 35 U.S.C. 371.
2. ☐ This is a **SECOND or SUBSEQUENT** submission of items concerning a submission under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☐ The US has been elected (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☐ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☒ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language Publication of the International Application (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A preliminary amendment.
14. ☐ An Application Data Sheet under 37 CFR 1.76.
15. ☐ A substitute specification.
16. ☐ A power of attorney and/or change of address letter.
17. ☐ A computer readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 37 CFR 1.821 - 1.825.
18. ☐ A second copy of the published International Application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☐ Other items or information:

PTO-1390 (Rev 02-2005)
Approved for use through 30/1/2007. OMB 0651-0021
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

U.S. APPLICATION NO (If known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
	PCT/GR2004/000043	

The following fees have been submitted:

	CALCULATIONS	PTO USE ONLY
21. ☒ Basic national fee ... $300	$ 300	
22. ☒ Examination fee If international preliminary examination report prepared by USPTO and all claims satisfy provisions of PCT Article 33(1)-(4) ... $100 All other situations ... $200	$ 200	
23 ☒ Search fee Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority ... $100 International Search Report prepared and provided to the Office ... $400 All other situations ... $500	$ 400	
TOTAL OF 21, 22 and 23 =	$ 900	
☐ Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing or computer program listing filed in an electronic medium) The fee is $250 for each additional 50 sheets or paper or fraction thereof.		

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof (round up to a whole number)	RATE	
- 100 =	/50 =		x $250	$

Surcharge of $130.00 for furnishing the oath or declaration later than 30 months from the earliest claimed priority date (37 CFR 1.492(h))				$
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	$
Total claims	11 - 20 =	—	x $50	$
Independent claims	4 - 3 =	1	x $200	$ 200
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $360	$
			TOTAL OF ABOVE CALCULATIONS =	$ 1100
☒ Applicant claims small entity status. See 37 CFR 1.27 - fees above are reduced by ½.				
			SUBTOTAL =	$ 550
Processing fee of $130.00 for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(f))			+	$
			TOTAL NATIONAL FEE =	$ 550
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property			+	$
			TOTAL FEES ENCLOSED =	$ 550
			Amount to be refunded	$
			Amount to be charged	$ 550

a. ☐ A check in the amount of $ ... to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. ... in the amount of $ ... to cover the above fees.
A duplicate copy of this sheet is enclosed.

c. ☐ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. ... A duplicate copy of this sheet is enclosed.

d. ☒ Fees are to be charged to a credit card. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the International Application to pending status.

SEND ALL CORRESPONDENCE TO

SIGNATURE

PATTAKOS Manousos
NAME

REGISTRATION NUMBER

PTO/SB/02A (09-04)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet

Page ____ of ____

Name of Additional Joint Inventor, if any: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle (if any))	Family Name or Surname
JOHN	PATTAKOS

Inventor's Signature _____ Date: JUNE 07, 2005

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Inventor's Signature _____ Date: JUNE 07, 2005

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Name of Additional Joint Inventor, if any: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle (if any))	Family Name or Surname

Inventor's Signature _____ Date: _____

Residence: City	State	Country	Citizenship

Mailing Address: _____

City	State	Zip	Country

DECLARATION – Supplemental Priority Data Sheet

Foreign applications

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	Certified Copy Attached? NO
20030100353	GREECE	08/18/2003	☐	☐	☐
			☐	☐	☐
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May 11, 2006

To the USPTO Commissioner for Patents

Subject : Errors in the Patent Application Publication of the US Patent Application 20060091344 (Publication on May 4, 2006).

Dear Madam /Sir

In the above mentioned patent Application publication there are some mistakes:

1. Applicants and Inventors are the following three persons:
PATTAKOS Manousos
PATTAKOS John
PATTAKOS Emmanouel
(names and data identical to those appearing in the PCT Publication of the PCT/GR04/000043).

2. The 15 claims appearing in USPTO publication are the original ones and not the 11 amended claims under PCT/Article 19. The publication of the 11 amended claims happened before the application for the entry into US National phase. Reasonably, the 11 amended claims are the ones to be examined and not the 15 original ones.

3. The US class is defined as 251/251 which seems not the correct. As closest prior art is mentioned the PCT/GR02/00035, which is now the United States Patent US 6,892,684 and which is classified in the 123/90.16 class. As the present patent and its closest prior art are very similar, it seems they have to belong in the same class.

Please correct the above mentioned mistakes and let us know accordingly.

Thank you
Manousos Pattakos John Pattakos Emmanouel Pattakos